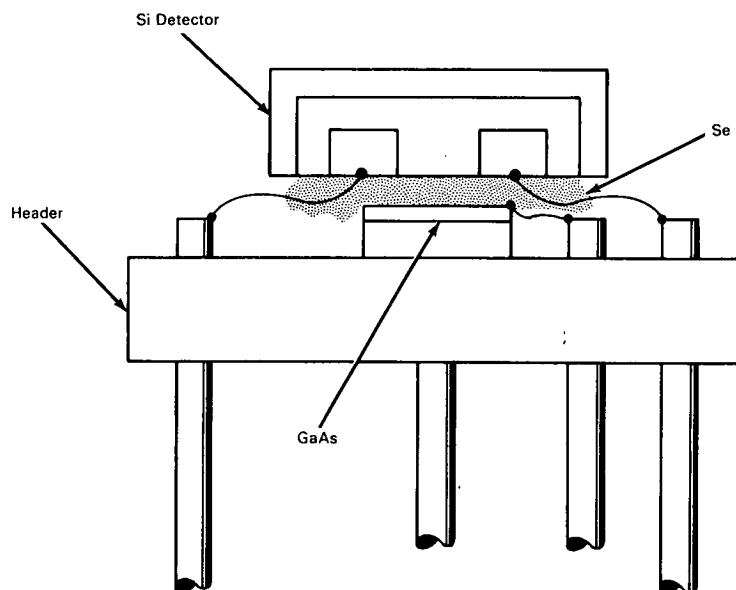


# NASA TECH BRIEF



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## Selenium Bond Decreases On Resistance of Light-Activated Switch



**The problem:** To decrease the *on* resistance of a gallium arsenide-silicon (GaAs-Si) light-activated, low-level switch by reducing the light diffusion through the bonding agent between the Si detector (photosensitive element) and the GaAs diode actuator.

**The solution:** Use vitrified amorphous selenium (whose refractive index is close to that of the actuator) as a bonding agent instead of an epoxy resin.

**How it's done:** A GaAs diode is mounted on a header, and a small amount of powdered amorphous selenium is placed on the diode. The header is then heated to approximately 200°C and quickly cooled, thus forming a vitrified (glassy) selenium dome on the diode. The silicon detector is positioned on the

selenium dome, the lead wires are connected to the header posts, and the header is reheated to 200°C. The detector is pressed into the fused selenium and the assembly is allowed to cool, thus forming an integrated light switch.

### Notes:

1. The *on* resistance of the switch using selenium as the bonding agent is 50 ohms at an element separation distance (GaAs to Si) of 10 mils, compared to 150 ohms at a separation distance of 2 to 3 mils using an epoxy bonding agent.
2. This light-activated switch should be used under a pulse condition (low duty cycle) to prolong switch life and minimize errors due to heating, devitrification, and overdriving.

(continued overleaf)

3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
Jet Propulsion Laboratory  
4800 Oak Grove Drive  
Pasadena, California, 91103  
Reference: B65-10324

**Patent status:** NASA encourages commercial use of this innovation. No patent action is contemplated by NASA.

Source: International Business Machines  
under contract to  
Jet Propulsion Laboratory  
(JPL-SC-101)